

APPLICATION FOR LETTERS PATENT OF THE
UNITED STATES OF AMERICA

For the invention entitled:

COMPACT AUXILIARY POWER GENERATOR

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1 COMPACT AUXILIARY POWER GENERATOR

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3 RELATED APPLICATION

4 This invention is a continuation-in-part of Application
5 Serial No. 09/603,725 filed June 23, 2000 the content of which
6 is incorporated herein by reference.

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8 FIELD OF THE INVENTION

9 This invention relates to auxiliary power generators and,
10 in particular, to a compact auxiliary power generator having a
11 generator assembly coupled directly to a diesel engine for use
12 in mobile applications, such as large trucks.

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14 BACKGROUND OF THE INVENTION

15 Semi-truck tractor trailers frequently employ the use of
16 an auxiliary generator to meet electrical requirements when the
17 main engine is not running. Tractor trailers having a "bunk"
18 or "sleeper" cab area are common and most interstate fuel
19 stations permit the drivers of such vehicles to sleep in their
20 cab. The passenger area of the truck may include convenience
21 items such as a television, VCR, refrigerator, air conditioner,
22 coffee maker, even a microwave oven. While such items may run
23 on direct current provided by an engine mounted alternator, or
24 even alternating current by use of an inverter, the truck

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1 engine must be running. Idling laws now prohibit the running
2 of the main engine for prolong periods of time. However, the
3 time and cost savings of keeping the driver near the vehicle
4 while at rest are obvious and ancillary benefits include
5 security as the operator does not leave the vehicle unattended.

6 A problem with the use of auxiliary generators is directed
7 to size, weight, and placement. The size of an auxiliary
8 generator is critical for if the overall dimensions are too
9 large, there will be insufficient areas on a truck for which to
10 place the auxiliary generator. For instance, it is not possible
11 to place an auxiliary engine within the existing main engine
12 compartment. Placement of an auxiliary engine on the frame
13 rails is a known alternative, however conventional auxiliary
14 generators employ baseplates making the size, weight, and
15 subsequent placement a problem.

16 Generators also have a problem with vibration caused by
17 misalignment. Installations commonly address misalignment by
18 mounting the engine and the generator set on a heavy baseplate,
19 the total weight of which may easily approach 500 lbs. By
20 mounting both units on a baseplate the misalignment of the belt
21 drive between the engine and generator is prevented. However,
22 the mounting of a generator and an engine on a baseplate
23 results in a large usage of space due to the separation between
24 the components.

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1 The use of gasoline engines to power a generator is also
2 well known. Gasoline engines are lighter in weight and smaller
3 in size when compared to a diesel engine of the same
4 horsepower. However, gasoline is a very volatile fuel and when
5 a gasoline engine is placed into the confines of a container or
6 step box, the gasoline engine must be made either "spark proof"
7 or it will present a lethal environment that can create an
8 explosion. Further, when used on a diesel powered tractor
9 trailer, a separate fuel tank is required and grounding becomes
10 critical since any stray spark can ignite gasoline.

11 The Applicant is a well known assembler of diesel
12 engine/generators packages and has been awarded patents for
13 various arrangements. U.S. Patents 6,047,942 and 5,765,805
14 granted to the Applicant disclose the use of a combination
15 engine/generator that is lightweight and of a novel space
16 saving configuration.

17 Thus what is found lacking in the art is a low profile
18 generator set that employs a diesel engine in a configuration
19 that minimizes space, weight, vibration and includes an
20 installation mount integrating the generator set with a diesel
21 powered tractor trailer.

1 DESCRIPTION OF THE PRIOR ART

2 An integral engine generator set that may be used in this
3 invention is disclosed in U.S. Patent No. 5,765,805 to G.W.
4 Kennedy, the inventor here. The disclosure of this patent is
5 incorporated herein by reference.

6 The integral engine generator set described in the patent
7 utilizes a bracket interposed between the engine and generator
8 for direct coupling of the components. The inspection plate of
9 the engine is replaced by the bracket and the generator is
10 bolted to the other side of the bracket. The bracket
11 eliminates the need for a common baseplate and a belt
12 tensioner. The engine and bracket may have isolation mounts
13 for support or the engine, alone, may be mounted to the
14 vehicle.

15 Base plates for motors are old and well known in the prior
16 art as exemplified by U.S. Patent No. 2,662,988. Also,
17 mounting brackets are conventional as shown by Credle, Jr. in
18 U.S. Patent No. 4,441,684.

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20 SUMMARY OF THE INVENTION

21 The instant invention is a unitary combination engine
22 generator set combined with a support housing that is
23 incorporated into the design of the vehicle in which it is
24 mounted.

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1 The instant invention is an engine/generator assembly
2 designed specifically for semi-truck tractor trailer
3 applications. The assembly employs a rigid integral diesel
4 engine/generator with a synchronized belt drive therebetween.
5 The assembly is positionable within an enclosure by employing
6 a horizontally disposed engine providing a low profile and
7 securing the assembly within an enclosure to the chassis of the
8 truck, in a similar manner as an auxiliary fuel tank.

9 An objective of this invention is to provide a diesel
10 engine/generator set having a very low profile for placement
11 within an existing compartment of a vehicle.

12 Another objective of this invention is to provide a diesel
13 engine/generator set that is positionable within a conventional
14 low profile step securable to a truck chassis.

15 Still another objective of this invention is to provide a
16 storage container for an auxiliary generator that conceals the
17 contents from theft and adverse environmental conditions.

18 Another objective of this invention is to provide a low
19 profile mount for a diesel engine/generator set that minimizes
20 vibration in the support vehicle.

21 Yet another objective of this invention is to provide a
22 low profile mount which permits easy access to the engine and
23 generator set.

24

1 Yet still another objective of this invention is to
2 provide a generator storage box that further operates as a
3 step.

4 Other objectives and advantages of this invention will
5 become apparent from the following description taken in
6 conjunction with the accompanying drawings wherein are set
7 forth, by way of illustration and example, certain embodiments
8 of this invention. The drawings constitute a part of this
9 specification and include exemplary embodiments of the present
10 invention and illustrate various objectives and features
11 thereof.

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1 BRIEF DESCRIPTION OF THE FIGURES

2 Fig. 1 is a perspective view of the low profile generator
3 mount installed on a large truck;

4 Fig. 2 is a perspective of the diesel engine/generator
5 set;

6 Fig. 3 is a perspective of the mount of Fig. 1 with the
7 diesel engine/generator exposed;

8 Fig. 4 is another embodiment of the low profile generator
9 mount;

10 Fig. 5 is a prospective of the rear of the truck step;
11 and

12 Fig. 6 is a side view of the truck step.

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1 DETAILED DESCRIPTION OF THE INVENTION

2 Now referring to Fig. 1 which shows an illustration of a
3 large truck 1 having a chassis, or frame, in which an external
4 fuel tank 5 is typically mounted between the cab 7 and the
5 truck bed 9 or trailer, not shown. The size and height of the
6 truck normally requires steps located beneath the door 11 to
7 gain entry to the cab 7. In some truck designs, the steps are
8 faired into the external fuel tanks for aesthetics and
9 aerodynamics. In other designs the tanks are behind the doors
10 of the cab and the steps are separate.

11 In the first embodiment, the generator set of the instant
12 invention is incorporated within a box 40 or step structure of
13 the truck. The step structure 40 is made of metal attached to
14 the truck frame 3 and extends below the frame. The step
15 structure has a lower step 42, extending horizontally closest
16 to the ground, with a non-slip surface 44 extending between
17 side walls 46 and 48 at each end of the step. The side walls
18 form an integral portion of the storage box 40 which is
19 attached to the truck frame by bolts, welding, rivets, and the
20 like. The step 42 may be attached to the brackets in the same
21 manner or made from a single piece of metal further forming a
22 platform for mounting of the generator within the storage box.
23 The step 44 may be a solid planar metal sheet with a non-slip
24 tread formed in the upper surface or an open mesh material.

1 The step 42 extends outwardly from the enclosure sufficiently
2 to provide a safe footing.

3 A vertical cover 50 is rotatably attached to the brackets
4 by a hinge 52 at the upper edge. The cover forms the front
5 wall of the enclosure. The lower edge 54 of the cover 50 may
6 have a latch mechanism 56 to cooperate with the step 42 to
7 releasably hold the cover 50 in place in the closed position.
8 When closed, the cover forms the vertical riser between the
9 lower step and the upper step. The height of the vertical
10 riser is limited to the distance an average person can step,
11 e.g. approximately 14 to 17 inches. The hinged cover 50
12 provides access to the generator set while providing protection
13 for both the machinery and the operators. The upper surface 58
14 of the cover 50 may form a second step if necessary to provide
15 egress into the cab 11. Another fixed vertical cover opposite
16 the front wall forms the back wall 51 of the enclosure. The
17 wall 51 has perforations 53 for ventilation. In one embodiment
18 (not shown), a hinge may be at the lower edge of the side wall
19 and the latch near the upper step. Alternatively, the top may
20 be removable such as those found on Peterbilt trucks. In a
21 preferred embodiment, the planar horizontal surface 58 of the
22 enclosure is attached to the side walls 60 and 62 to form the
23 upper step. Kenworth trucks typically include a hinged cover
24 for storage boxes.

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Now referring to Figure 2, there is shown a conventional diesel engine 100, such as manufactured by the Kubota Corporation, having a horizontally disposed cylinder 112 and an integral generator 142 located on opposite sides of the crank case 116. This orientation is necessary to accommodate the internal space requirements existing in the step 42. In this installation, the piston reciprocates parallel to the step surface 44.

The engine, shown in Fig. 3, is self contained having a radiator 113, starter 114, crank case 116, air cleaner 118, and fuel injections system 120. The crank case 116 includes isolation mounts 122 mounted to the crank case by the use of support brackets.

A support bracket 136 is constructed from an aluminum plate having a thickness of about 3/8 inch with a first side surface 138 securable to the engine and a second side surface 140 available for securing the generator 142. The bracket 136 may be through-bolted to the engine and generator or otherwise fixed to provide a rigid engine/generator set. A second set of isolation mounts 144 is secured to the bracket 136 providing a structure for mounting inside the storage box 40.

The low profile generator set has the approximate dimensions of 28 inches length, 17 inches height and 16 inches deep. The preferred engine 100 is a one cylinder liquid cooled

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Kubota diesel engine turning a generator of 3.5 kilowatts capacity at 120 volts and 30 amps. In another embodiment having a height approximately 14 inches, the engine radiator 113 and cooling fan 115 are located outside the enclosure and connected to the engine by the requisite hoses and wires, as shown in Figures 5 and 6. The radiator is secured to the enclosure wall by the use of isolation supports or rubber biscuits 111. The rubber biscuits 111 space the radiator apart from the enclosure a predetermined distance creating a relief space. The fan 115 is positioned outboard the radiator wherein the fan draws air from the relief space and through the radiator 113. In addition, the enclosure preferably includes a discharge opening or perforated back wall 51 wherein the fan draws air from the enclosure with the relief space providing additional air if the enclosure lacks sufficient air displacement. In this position, the fan serves the dual purpose of extracting heated air from the enclosure and providing air flow across the radiator. Alternatively, the generator engine can access the primary cooling system of the truck. In this arrangement, the radiator and fan can be removed and fluid circulated through the truck radiator system wherein by its shear volume may not require an auxiliary fan for cooling of the smaller engine coupled to the generator.

Figure 4 sets forth another embodiment wherein the

1 generator set may be mounted in a box 70 having a hinged top
2 72. The box 70 would appear that of a conventional storage box
3 found on trucks and may, or may not, operate as a step. The
4 top 72 may be opened to gain access to the generator set
5 rotating along a hinge and secured closed by a latch mechanism
6 74 to releasably connect the top step to the remainder of the
7 box. In both embodiments of the enclosure, there is adequate
8 ventilation to permit dissipation of heat and engine air
9 intake.

10 It is to be understood that while a certain form of the
11 invention is illustrated, it is not to be limited to the
12 specific form or arrangement of parts herein described and
13 shown. It will be apparent to those skilled in the art that
14 various changes may be made without departing from the scope of
15 the invention and the invention is not to be considered limited
16 to what is shown and described in the specification and
17 drawings.

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